RENEWABLE ENERGY AND WATER DEVELOPMENT

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THE PROBLEM

The development of renewable energy resources in the State of Hawaii to produce electricity for distribution and use is hampered by the limited capacity of existing utility grid systems to accept the power generated. While this problem is characteristic with all renewable energy technologies, the discussion which follows will focus on electricity produced from geothermal energy.

Geothermal resources on the Island of Hawaii are estimated to far exceed the demand for electric power on the island, and efforts have been underway to develop these resources to serve the electricity needs of the other islands, principally Oahu. An underwater cable system designed to transmit up to 500 MW of power from the Big Island to Oahu is now being developed and can be in place by the early 1990's.

Current and anticipated electricity needs on the island of Oahu will not permit the continuous utilization of 500 MW of electricity transmitted by the cable system. This is illustrated on the attached graphs showing the extent to which geothermal power can be utilized. As the graphs indicate the demand for power on Oahu varies diurnally by a factor of about 2 between the minimum and peak demands. For reliability reasons, Hawaiian Electric Co. (HECO) must generate on the island a minimum of 334 MW at all times; geothermal power can only supply the demand above this amount. For the typical days illustrated, an average of only 67-78% of the total power produced by a 500 MW geothermal development can be absorbed by Oahu's grid system. One-fourth of 500 MW is about equal to the Big Island's current generating capacity.

Generally speaking, it is undesirable to vary the output of fluids from geothermal wells in order to vary the production of electricity from a geothermal power plant. Thus, some means must be found to dispose of the exess fluids, or excess power is produced. The prospect of less than

full utilization of the geothermal energy produced impacts unfavorably upon the economic feasibility of geothermal development.

THE OPPORTUNITY

The economic feasibility of geothermal and other renewable energy developments can be greatly enhanced by the use of the excess power for other than conventional utility distribution. Proposed herein is the use of this energy for the development of fresh water supplies.

The basic concept presented here is to use the excess power whenever it becomes available to collect and pump fresh water to a reservoir at a sufficient elevation so that the water can be delivered to where it is needed through gravity flow. By installing a hydroelectric generating plant to harness the energy in the flowing water, electricity can be generated at times when it is needed and its value is highest. This idea can be considered as an extension of the concept of a pump-storage system used widely throughout the country.

THE BENEFITS

Many benefits can conceivably be gained from the concept described above. Among them are:

a. Fresh water can be collected and stored in a reservoir at very low energy costs.

b. High value electricity can be generated from the water flowing from the reservoir to a destination at a lower elevation. By generating power where needed savings in transmission costs may also result.

c. Fresh water for agricultural, industrial and urban uses can be delivered where needed at economical costs.

d. The development of fresh water supplies using excess power can occur at either or both sides of the cable transmission system.

e. Productive use of the excess power can improve the economic feasibility of geothermal and other renewable energy systems, and accelerate the commercialization of Hawaii's renewable energy resources.

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